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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,228	02/12/2004	Je Won Kim	2336-241	2636

7590 03/08/2006

LOWE HAUPTMAN GILMAN & BERNER, LLP
Suite 310
1700 Diagonal Road
Alexandria, VA 22314

EXAMINER

MULPURI, SAVITRI

ART UNIT	PAPER NUMBER
2812	

DATE MAILED: 03/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/776,228	Applicant(s) KIM ET AL.	
	Examiner Savitri Mulpuri	Art Unit 2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-210 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/05/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/23/2006 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-5, 7-15, 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orita et al (US 6,673,702) in combination with Nakamura et al (US 5,578,839) and Toshiba JP-1127557

Orita et al teaches growing GaN buffer layer on either sapphire substrate; treating the buffer layer in hydrogen atmosphere or hydrogen gas mixed with other gases in MOCVD, at temperature of 500- 900 °C, to remove oxide layer (see col. 4, lines 39-47; col. 7, lines 1-30); successively growing first GaN based layer, active GaN

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based layer and second GaN based layer on the buffer layer (see 7C). Orita et al also teaches growing first active and second GaN based layers in MOVPE or HVPE.

Though Orita et al teaches both HVPE and MOCVD for both buffer layer and active layers, Orita et al does not teach specifically which layer is grown by what technique.

However, it is well known that HVPE give fast growth rate with low quality GaN layer and MOCVD give low growth rate and high quality and it is obvious to one of the ordinary skill in the art to grow buffer layer in HVPE at fast growth to get thick buffer layer and active layer in MOCVD with slow growth rate and thin layers for light emission. Using thick layer is essential as buffer layer because thick layer are useful not to cause any defects in the subsequent device layers.

Orita et al do not teach forming buffer layer being undoped buffer layer.

Nakamura et al teaches GaN based undoped buffer layer on the substrate and then successively growing lower clad layer "16" and active layer "16" and upper clad layer "20" on the undoped buffer layer "14" (see fig 1 and col. 5, lines 65-67, col. 6, lines 5-21). It would have been obvious to one of ordinary skill in the art to form undoped buffer layer in the invention of Orita et al because undoped buffer layer can be useful as insulating layer between the active layer by providing good isolation, and undoped buffer layer can would not have problem out diffusion of the dopants into the active layer because the buffer layer is undoped buffer layer.

Orita et al do not additionally teach heat-treating step. Toshiba teaches annealing the GaN layer at a temperature between 200- 400 C to avoid degradation of the doped GaN layer (see abstract). It would have been obvious to one of ordinary skill in the art to

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perform heat treatment of the GaN layers, in nitrogen atmosphere, in the invention of Orita et al because heat treatment for the benefit of increasing the dopant activity in the GaN layer as well as obtaining the smooth surface by replenishing the loss of nitrogen, which inherently happens in the invention of Orita et al during the high temperature treatment step for removing oxygen. It is well known that high temperature treatment depletes the nitrogen from the surface nitride semiconductor layer.

Claims 6, 16 rejected under 35 U.S.C. 103(a) as being unpatentable over orita et al in combination with Nakamura et al and Toshiba (Jp-1127557) as applied to claims 2-5,7-15,17-21 above, and further in view of Lee et al.

Orita et al doe not teach nitridation of the substrate. Lee teaches nitridation of the substrate. It would have been obvious to one of ordinary skill in the art to perform nitradation on the substrate prior to growing GaN based layer because such nitridation gives high quality nitride based semiconductor layers.

Applicant's arguments with respect to claims 2-21 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is 571-272-1677. The examiner can normally be reached on Mon-FRi from 8 a.m. to 4.30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt, can be reached on 571-272-1873 The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Savitri Mulpuri
Primary Examiner
Art Unit 2812